

Knowledge Transfer Framework for Managing Knowledge in Relief Organisations

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In recent years, knowledge management (KM) theory has become an omnipresent and important element of organisational development. It includes processes intended to improve organisational effectiveness and it describes the convergence of people, processes, and systems. However, its application is limited to the development of technology for document repository and sharing. To promote new ways of approaching KM, this paper focuses on four knowledge topics: the use of human capital, social capital, structural capital, and artificial intelligence. Accepting that the four components of KM: people, processes, tools, and organisation, are interdependent, nested, and porous, then getting relevant knowledge to those who need it, when they need it, is critical for knowledge transfer. This paper considers whether the recovery of forgotten knowledge will create value for organisations. It proposes a new holistic framework to enhance the transferability of tacit and implicit knowledge in emergency relief organisations. It considers the application of artificial intelligence in the aid sector as a means of achieving this, and it proposes its use for providing ready-to-use knowledge for decision making in emergencies. Using a quantitative and qualitative research approach, this research resolves several ambiguities in the application of the KM discipline within emergency relief organisations. It found that there is no relationship between the employees' age and their attitude to communicating across organisational boundaries to exchange knowledge, yet age is a factor in the use of organisational social networks as a communication tool. Further, it found little difference in the way employees of various designations comprehend the human, structural, and social capital elements of an organisation, yet the importance, selection, and use of each of these elements is dependent on the employees' designation and/or position in the organisational hierarchy. Finally, it found that age is a key factor in the frequency of changing jobs, which contributes to the loss of tacit and implicit knowledge in aid organisations. This paper concludes by providing recommendations for action within each of the five knowledge sharing dimensions: individual, social, managerial, cultural, and structural.

Keywords: artificial intelligence, knowledge management, knowledge transfer, relief organisations, human capital, structural capital, social capital

The Humanitarian Context

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Humanitarian assistance is an industry worth \$27.3 billion, with an average annual growth of 6% (Global Humanitarian Assistance Report, 2017). Aid organisations' value chains include insourcing and outsourcing activities that allow the organisation to externalise parts of business processes to third-party partners. Both outsourcing and insourcing are new trends that are expected to transform the way operations in the aid sector are designed. It emphasises the strengthening of collaborative agreements between national governments, the relief organisations, and the private sector (OCHA, 2009). This partnership, includes the transformation of developing countries' public services into more evidence-data-driven services, entailing the use of technological innovation and new knowledge.

The humanitarian sector is being forced to adapt its ways of providing aid services. For instance, donors expect to see improvements in efficiency, effectiveness, and data visibility of the service delivery. This new way of providing humanitarian services creates opportunities for researchers to propose innovative ways to approach the knowledge management (KM) topic in the aid sector.

The new approach to KM includes the exploitation of new technologies and knowledge held by corporate companies, to cover the existing gap in emergency relief organisations (ERO), and national government processes and systems. Thus, many companies can now bring their knowledge directly to national government in the form of third-party logistics (3PL). These 3PL partners can be major players for specific business lines, specialised in delivering services such as supply chain systems management, including transportation, warehousing and storage, packaging, and distribution and information systems.

The knowledge gap in EROs can be for any activity that is part of the value chain, so improvements in knowledge flow are required to enhance their performance in delivering relief services. EROs are characterised by their volunteer-based workforce, donation-based funding systems, and value-based leadership approach to fulfilling their missions (Ramia & Carney, 2003). The ERO concept is an extension of the traditional charity-based business model, which involves a non-profit approach in which volunteers commit an amount of time as their contribution to society. Therefore, the research perspective focuses on the contemporary ERO business model, rooted in charity-based intrinsic values.

Table 1

New Knowledge Topics for Relief Organisations

Human capital Examines aid workers' dissatisfaction with the current role of organisations in the management of age differences, contingency workforce, and rotational management, to improve efficiency in their positions.	Structural capital Analyses why aid workers are dissatisfied with the way that access to knowledge is handled. It involves the organisational knowledge governance for accessing intra-organisational knowledge platforms.
Social capital and collaboration Examines the impact of different perspectives on the way employees interact within and between organisations. It includes examining the positive impacts of fast job rotations on effective knowledge delivery.	Artificial intelligence technology Focuses on reconciling the gap between the urgency of using AI. It involves the employee's knowledge in interpreting and using the information generated by AI, to deliver up-to-date knowledge for decisions in the field.

This research explores how intrinsic values have a positive impact on the effective knowledge insights to improve an organisation's competitive position in the aid sector. Further, it explores the deficiency in both the effective exploitation of existing knowledge encompassing human capital (HC), structural capital (StC), and social capital (SoC), and in the use of new technologies such as artificial intelligence (AI). The issue is that EROs' effectiveness is affected by these deficiencies that relate to their inability to integrate the four knowledge topics, as identified in Table 1, within organisational knowledge processes, to create value. Further, the paper

describes each of the four KM topics. In summary, the arrival of the private sector into the humanitarian sector, brings additional challenges that can be taken as new opportunities to EROs operating in the sector.

Research Objectives

The purpose of this research is to identify, describe, and determine the experience of ERO employees, with the following objectives in mind:

- Identify the organisations' formal approach to the management of HC, entailing the handling of contingent workforces, and the efficient use and transfer of tacit, implicit, and explicit knowledge within and between organisations.
- Describe the organisations' approaches to StC, which involves the employees' access to and use of organisational digital networks across the levels of hierarchy.
- Describe the organisations' approach to SoC, which includes the employees' attitudes towards the use of social media, and collaboration within and between organisations.
- Determine the organisations' approach to AI, which includes how employees view the use of AI in the aid sector and the potential challenges.

A critical review of the academic concepts within the emergency relief perspective found little dialogue on the four KM topics. The researcher reviewed over 120 peer-reviewed academic papers in this area, extended to fields other than the emergency relief field. This research sources led to the identification of research gaps in the literature which relate to the posing of the following research questions (RQ):

- RQ1: What are the factors preventing the optimal use of tacit and implicit knowledge systems?
- RQ2: How do managers and non-managers use organisational knowledge and infrastructure to share new knowledge or ideas?
- RQ3: How can tacit and implicit knowledge transfer contribute effectively to operations in bottom-line activities?
- RQ4: How do managers and non-managers interact within and between themselves to share new knowledge or ideas?
- RQ5: How can AI be used to improve data analysis for management and decision making?

Methodology

The methodology applies a combination of positivist philosophy for quantitative research and interpretivism for qualitative research.

The positivism element refers to the use of an online survey to assess the use of the four knowledge topics in EROs. This element of the research involved 149 respondents from 15 international and 10 national organisations. The respondents were from various organisations: international non-governmental organisations (INGO)—73%, international organisations (IO)—9%, the United Nations (UN)—9%, national non-governmental organisations (NNGO)—8%, with 1% of respondents excluded from the analysis. The international organisations included: ICRC, 4 MSF-sections, WHO, UNICEF, WVI, UNOPS, FAO, WFP, UNHCR, ACTED, ACF, ALIMA, COOPI/COSVI. The NNGOs are from Burundi, Democratic republic of Congo, Mauritania, South Africa, Tanzania, and Zimbabwe. The national organizations included: Manual Evaluation, JUH, African Community Fund for Education Group (ACFEG), Tanzania Red Cross Society, ECPAT France, UFUT44, Better Cotton Initiative, Interpeace, AKDN, CIDRI (centred'initiation au développement rural enIturi).

This element of the research centred on two independent variables: age categorised by employees older than 35 years (63%) and those younger (37%); and employment designation split between managers (65%), nonmanagers (24%), and others (11%), which was a group designating themselves as specialist or consultants.

The statistical tests on the quantitative data aimed to assess the research findings regarding the attitudes and experiences of aid workers towards the four knowledge topics. For this purpose, a composite variable was developed to verify the reliability and consistency of the scores from one test to another. The finding is that the reliability is higher, with Cronbach's alpha of 0.8 determining the consistency of the interaction score.

This work combines established research with applied qualitative research to help with identifying new topics. This process motivated the researcher to identify new research questions as part of the dissertation work, with regard to how KM theories could be used by EROs in response to the research problem. The interpretivism element was conducted through semi-structured interviews administered to 10 aid workers from 5 different EROs who had responded to the quantitative survey.

The research methodology and ethical aspects were submitted to the Swiss Business School (SBS) Ethical Review Board. The researcher ensured that the general data protection regulation (GDPR) compliant standards were upheld, and participants' names will not be disclosed to protect the research participants. All participants were informed about the research project and its purpose, either through email or in person. All participants were free to quit the survey at any time without penalty.

The following sections discuss each of the four main knowledge topics, including the critical factors that can affect efficient knowledge delivery in the aid sector. Further, it highlights the challenges that aid workers face in the creation of a proper environment to allow for communication synergy and knowledge sharing between two generations of aid workers.

Human Capital

In the emergency aid sector, human resources are the primary asset of any successful ERO.

Bontis (2001) defines HC as an integral part of the historical values, culture, and work environment. Gendron (2004) defines HC as "a wider and multifaceted concept in conjunction with consistent investments in people to enhance their ability to engage in productive activities". It entails a combination of an employee's skills, competencies, and knowledge acquired throughout their career, which creates value. Table 2 presents additional definitions for HC.

Table 2

Additional Definitions for Human Capital

Definitions of human capital	Reference
Human capital is a combination of employee's tacit, implicit, and explicit knowledge that creates value for the organisation.	Edvinsson (1997)
Human capital reflects individuals' knowledge, skills and abilities, commitment, and ideas that add value to the organisation.	Coleman (1990)

Source: further developed by the author.

For this research, the HC, is summarised as the valuing of employees tacit, implicit, and the conversion process to explicit knowledge. This provided the foundation for the development of RQ1—What are the factors preventing the optimal use of tacit and implicit knowledge systems?

This RQ aims to identify whether significant differences and relationships exist between the

human-related factors identified, and knowledge circulation within and between organisations. It includes the perception of aid workers of the way that organisations apply the standards to meet high KM performance and to create value. A *t*-test paired two-sample for mean to determine whether employees younger and older than 35 years had similar ratings for the use of organisational social networks. The analysis showed that employees older than 35 years ($M = 2.55$) were less inclined than millennials ($M = 2.87$) to use organisational social networks to interact with people inside and outside the organisation ($t [142] = 2.08$; $p < 0.05$). This result demonstrates the rigidity of older than 35 years in extensive use of technology to communicate outside organisation boundaries.

In addition, the researcher evaluated whether there is any relationship between an employee's age and the frequency with which he or she changes jobs. The analysis concluded that younger employees change jobs more frequently than their older colleagues ($X^2 [4, N = 296] = 18.48$, $p < 0.001$). This is strongly related to the notion that employees older than 35 years hold a significant proportion of an organisation's knowledge, so that millennials are staff that can quit their jobs at any time.

Qualitative observations with aid workers from different organisations in about five countries complemented the quantitative analysis associated with RQ1. The non-managers claim a more inclusive approach to KM, which includes gender, diversity, and equal opportunities for learning. Managers argue that managing age differences is a challenge for many, especially in terms of providing equal employee satisfaction in the workplace. For example, many team managers find it challenging to achieve knowledge synergies between people either side of the 35-year age border.

The non-managers commented that there are disagreements over the way that knowledge is handled within aid organisations. For example, one disagreement is that leadership positions are often given to people over 35, irrespective of whether they have the required technical knowledge. This is a major source of frustration for younger people because they are often more qualified academically. For instance, participants from MSF, WVI, and the UN explained that 5-10 years' experience in that organisation or in similar leadership positions elsewhere may be required for a leadership position in that organisation. However, this does not allow for people having multiple micro-experiences from spending 1-2 years each in different positions. One participant stated that "having experienced different positions within the last three or five years, in addition a master's degree, I may have a holistic view of the department's project challenges, especially in the current technological era."

A participant from WVI had the following comment:

We face difficulties in demonstrating our potential knowledge within the organisation, due to the lack of trust from the directors. We can do more than they believe we know. The issue of lack of experience comes up often, but we have also observed that the so-called experienced workforce only cares about their positions and job security, and care less about addressing new challenges. For example, a manager older than 35, who has been in the position for over 10 years, continues to cite examples that are no longer relevant. When we say, for example, that we need to invest in AI technology to interact with beneficiaries and society sponsoring our actions, the answer is "why do we need to do so?" In my point of view, the organisation is missing an opportunity to integrate technology and build on it.

This issue was also observed in other organisations, including some UN agencies. The WHO, MSF, and UNICEF managers argued that maturity and learning are related to experience, which allows employees to gain confidence and trust. In this respect, a WHO logistics manager argued:

I started this job about 20 years ago, obviously, I am older than 35. However, there are other factors as to why people younger than 35 are underrepresented in management positions; one reason is that they are the so-called millennials. This

group does not have the same values as we do. For example, we value the organisation and they value the job. This may explain why we do not trust them; another reason is that when they get a better job, they just quit.

Another aspect that was raised was the contingent workforce, which refers to the pool of workers who are hired by an organisation on an ad-hoc basis. It consists of independent consultants or service providers (Agarwal, Bersin, Lahiri, Schwartz, & Volini, 2018). In this study, the contingent workforce also refers to the availability of external workers who perform activities that could otherwise be outsourced. This pool is usually described as temporarily hired staff, such as consultants or project-based contractors.

There are several ways to view contingent workforces. First, they may be external experts who bring new knowledge that could be codified, internalised, and disseminated within the organisation. Second, hiring a contingent workforce can be a way to identify and assess new talents who may be retained if the initial assessment is successful, so that new knowledge can be developed. The contingency workforce mechanism is applied in most important organisations, including throughout the UN system, IO, and INGO. In this regard, some participants suggested:

We do have doctors coming from university hospitals from all over the world to support our team in the field. The principle of having highly qualified experts who can be called and make themselves available to come and help during critical emergencies is essential, and it is part of our organisation's DNA. It includes experts in solving complex problems, such as "Ebola experts", who can write evidence-based cases and fulfill gaps in the field.

In recent research, the researcher finds that the retention of knowledge detained by employees of over 35 year is higher, and this type of knowledge is usually represented as employee's experience (Mazuze et al., 2020). It reflects the extent to which tacit and implicit knowledge is of greater value in relief organisations. The new research also provides additional findings with regards to disagreements over the way that knowledge is handled, it found a strong relationship between multiple micro-experiences and employees frequency of changing jobs within and between aid organisations. It also found that the assumption about employees age difference is strongly related to extensive use of contingent workforce.

Structural Capital

Edvinsson and Malone (1997), defined StC as organisational assets and capabilities that support employee's productivity: whether software, hardware, trademarks, patents, and everything that stays within the organisation when employees go home. Yundet et al. (2004) defines StC as the institutionalised knowledge and encoded experience used inside the databases, structures, systems, and processes of the organisation. Entailing an organisation value added minus (Firer & Williams, 2003). Table 3 presents a couple of definitions of StC from other authors.

Table 3

Definitions for Structural Capital

Definitions of structural capital	Reference
StC is tacit knowledge related to the internal processes of the organisation for distribution, communications, and management of scientific and technical knowledge.	Bou-Llusar & Segarra-Ciprés (2006)
StC and customer capital and business performance have a positive relationship with business performance, regardless of the industry.	Bontis (2001)

For this research StC refers to organisational knowledge governance, which is described as the employees' access to intra-organisational digital knowledge systems, processes, regulations and decision-making platforms,

forming the framework for organisational social culture. This leads to the posing of RQ2: How do managers and non-managers use organisational knowledge and infrastructure to share new knowledge or ideas?

This section discusses aid workers' viewpoints on the attitudes of themselves, of colleagues from the same or other organisations, and of line managers, and leads to the observation that, in most organisations, knowledge governance is centred on a technology-focused strategy, and so is determined by technological capabilities rather than the organisational knowledge needs. The creation of an environment to allow proper knowledge exchange within and between organisations is an important factor in encouraging appropriate knowledge sharing practices between employees and wider stakeholders. To assess the environment, the respondents were asked to comment on their line management's attitudes, on the employees' access and use of organizational technological infrastructures. The statistical analysis concluded that there is a strong relationship between an employee's designation and his or her attitude toward rating the three knowledges under IC ($X^2 [4, N = 996] = 123.92, p < 0.0001$). This means that non-managers more strongly agreed with the integration of three types of IC into the KM topic than the managers and specialists.

Current infrastructure governance, policies, and rules hinder the availability of technology itself. In the qualitative study there are two opposing viewpoints regarding access to the use of organisational social networks. In response to RQ2, some of the participants suggested that not all staff should have access to everything, while others said that there is tremendous institutional knowledge lost at bottom-line activities and by front-line staff.

During the discussions, aid workers asserted that restrictions on the front-line staff's access to organizational platforms, where they could share that knowledge, deprives the organisation of knowledge, which outweighs the risk of access. It was expressed as:

To conclude, I believe that the organisation is ignoring the potential stock of existing knowledge amongst the employees. If I could have access to the knowledge retained by health promoters, I would undoubtedly be more efficient including to articulate tactics to meet the objectives.

The group who support the idea of "not providing access to all staff" remain the minority, and their viewpoints are inconsistent and continue to evolve. Their arguments are along the following lines:

I do not see a value added in providing access to all, because some people's job should be focused on assisting beneficiaries instead of sitting behind screens. However, the reason why they cannot have access is because of a lack of digital systems or it is related to the individual managers and employees' lack of awareness of the purpose of the existing platforms. Another reason is the lack of sufficient organisation devices (computers) for everyone, to allow them to connect to organisational systems and platform. It includes the lack of personalised email addresses for a part of employees, which means limiting access to organisational knowledge. Therefore, it has nothing to do with organisational restrictions on accessing knowledge at all.

Additionally, in my view organisational digital platforms should remain restricted to certain people for data security reasons. Employees who are not included should rely on their personal social networks. I would also say that each employee should have access to what he or she is supposed to access. For example, the logistics and supply chain staff should have access to their own platforms, and likewise with other departments.

But I also understand that certain people usually working in the field such as medical staff, paramedics, and health promoters, with outreach activities may be deprived from the access due to the nature of their job. However, it is true that at some point, we should allow people to bring their own devices and provide them with an email address to enable access to knowledge for all; that would be the end of the story.

Social Capital and Collaboration

The exchange of experience that is created by people and shared with another, it happens naturally in all societies, either face-to-face or virtual interactions. The experiences in EROs can be shared within and outside the organisation, including with intended beneficiaries. Agndal and Nilsson (2006) argue that “interorganisational relationships entails social relationships between people”. DeVasconcelos, Seixas, Lemos, and Kimble (2006) define SoC as a need for a system to manage the knowledge process within and across organisations themselves and with wider stakeholders. Table 4 proposes additional definitions for SoC revisited during this research.

Table 4

Definitions for Social Capital

Definition of social capital	Reference
Social capital is “a productive dynamic resource and medium because of its mixture of resilient social trust, reliable norms of reciprocity, unspecified obligations and diffuse forms of commitment” (p. 172).	Bowey (2002)
Social capital can enhance the process of organisations’ interactions and make knowledge accessible for other organisations operating in the same sector.	Putnam (2000)

Various studies argue the poor interaction between relief organisations, aid workers, donors, and beneficiaries is the subject of animated debate across the aid sector as whole. Hence the development of RQ3: How can tacit and implicit knowledge transfer contribute effectively to operations in bottom-line activities?

In the quantitative study, age difference was used as the independent variable, and internal or external interactions as the dependent variable in the composite variable “interaction”. A chi-square test was used to analyse whether age is related to confidence to interact within and between organisations. The statistical analysis concluded that there is no relationship between an employee’s age and his or her attitudes towards communicating within and outside the organisation ($X^2 [1, N = 739] = 0.45, p > 0.05$). This result means that the difference discovered in surveys may not be necessarily related to age. Therefore, before generalising this result, other tests need to be conducted to determine the cause.

Further, in considering RQ4: How do managers and non-managers interact within and between themselves to share new knowledge or ideas? The statistical analysis concluded that there is no relationship between an employee’s designation and his or her attitude towards using social networks to interact ($X^2 [1, N = 127] = 0.0, p > 0.05$). This means that the use of social networks is not related to staff position.

These concerns were addressed in the qualitative study, which provides comments from managers and nonmanagers regarding the use of informal systems to exchange knowledge.

During the qualitative discussions to inform RQ3 and RQ4, younger people expressed frustration with the leadership’s lack of trust in them. The front-line staff maintained consistent viewpoints about their integration into the organisation’s knowledge circulation and the way that knowledge is valued. Their arguments were along these lines:

The organisation ignores the value of the knowledge retained by field workers. The value of field workers’ knowledge encompasses the feedback obtained from their direct interaction with beneficiaries. For example, the field health promoters, and the water, sanitation, and hygiene teams, know more about the beneficiaries they serve than the organisation’s leadership at top management levels. That is simply because these teams interact daily with the communities and understand additional factors in the community’s environment.

One of MSF’s employees stated that “[MSF] ignores how much its employees informally interact each

other and with beneficiaries”. She also referred to the example of the teams working in the field. She acknowledged the existing restrictions, and also said:

We fail to integrate the knowledge obtained from beneficiaries into organisational learning; information obtained from beneficiaries is only used for fundraising. For example, interacting with immigrants in the Mediterranean rescue operations is possible, but we avoid doing so for safety reasons, as we do not master the security of data. Therefore, to be in line with our code of ethics, we decided not to use technology to process the contents of our interaction. Thus, the interaction with beneficiaries is recorded on paper, and remains implicit.

A UN participant commented that “the information and technology frameworks emphasise what should not be done and not what should be done. Fearing mistakes, people tend to use the free public and personal social networks to interact, in order to be effective.” Another participant mentioned that he:

Organised a vaccination campaign in Zimbabwe, creating a WhatsApp-group to allow teams to share their information promptly. This project included about 120 people connected together to help each other in solving problems during the vaccination campaign. That helped me to lead from the back, without visiting each team in every location. Technical feedback could be given promptly, not necessarily by myself, but also by anyone having experience in that specific topic. We created a subject-based subgroup called “communities of practices”, where people could select their area of interest and join to share problems or provide solutions, based on their experience from another area. We also generated a rapid reporting system. For example, during the vaccination process, we set targets per team, per day, and per location, and teams could post whether their daily targets had been met. By so doing, we could identify where there was a stockpile against where shortages may occur, to promptly react by shifting vaccines from places with oversupply to places with shortages.

In WVI, the exchange of knowledge between employees and donors is coordinated through a centralised system. A WVI professional, who is trained to facilitate the communication between donors and beneficiaries by easing language barriers and so on, confirmed they have designed a system to allow “peering” interactions between donor and beneficiary. Peering is a sponsorship project in which the donor can directly support a given beneficiary at some point, engaging the donors in following up with the outcomes. This interaction pushed the visibility of relief services beyond a simple inter-agency collaboration. It extends the collaboration to the sponsors of the organisation’s mission statement and values, pin-pointing the new trend of aid sector accountability to their stakeholders.

Artificial Intelligence Technology

Before AI can be deployed in the aid sector, there is a need to define the scope of what type of AI can be used, and the purpose for using it in EROs. Hoeschl and Barcellos (2006) argued that “AI may not replace human being or create artificial mind and body, but it can replicate special activities necessary to save life in other places where it can be dangerous for human staff get”. Castrounis (2016) defines AI as “the ability to perceive information and retain it as knowledge to be applied towards adaptive behaviours within an environment or context.” Table 5 proposes a couple of additional definitions for AI suggested for this research.

Table 5

Definitions of Artificial Intelligence

Definition	Reference
AI is the study of how to make computers do things which, at the moment, people do better.	Rich et al. (2004)
AI is “any technique which enables computers to mimic human behaviour.”	RapidMiner (2017)

For this research, artificial intelligence includes the use of advanced algorithms and software to emulate human reasoning in the analysis of complex data, while considering the associated ethical risks. This led to RQ5: How can AI be used to improve data analysis for management and decision making?

It searched for the use of AI in filling the gap between performing tasks that are necessary but still deficient or inaccurate, thus informing the type of AI that adds value to bottom-line activities. Here AI is limited to GIS, drone-based technology, multilanguage text translation and readers, visual perception and image, facial recognition, and biometrics devices, the Internet of Things through mobile applications, and business intelligence-based data analysis. The statistical tests determined that there is a significant difference between preferences towards the five types of AI ($f [4,715] = 5.05, p < 0.001$). Thus, a post-hoc test was conducted to determine which types of AI are less rated than others. Table 6 presents the aid workers' rating preference.

Table 6

Aid Workers' Rating Preference in Using the Type of AI

Rank	Type of artificial intelligence	AI in practice	Mean	Example
1	Multilanguage voice navigation-GIS	Real-time data visibility, mapping	(M = 2.96)	Epidemic mapping, needs assessments
2	Drone-based technology	Prompted data collection, and processing, and transport	(M = 2.92)	Rapid assessment, transportation of essential equipment such as masks and med-lab products
3	Multilanguage text readers	Document translation	(M = 2.82)	Translation of guidelines
4	Visual perception and image recognition devices	Barcode reading, image, humans and objects recognition	(M = 2.76)	Inventorying, detecting counterfeit products and human temperature
5	Connected devices to mobile application	Real-time monitoring, data visibility	(M = 2.55)	Distance monitoring cold-chain, stockouts

The post-hoc test with significant differences determined that aid workers mostly prefer using geographic information system (GIS), followed by drone-based data collection systems, multilanguage text readers web applications, visual perception and image recognition devices and last of all connected devices.

The qualitative discussions identified the purpose for using each of the five types of AI. The use of GIS is highly rated, with aid workers commenting that it is an important technology to help field teams to get together numerous types of spatial data, analysing and managing multiple information, and generating visual maps for decision making. Second rated are drone-based data collection systems, especially where importance is placed on the promptness for humanitarian crisis data collection and processing, and the transport of medical items to places where alternative access is difficult. Connected devices, also called mobile applications, are least rated of the five groups posing a question for further research.

A specific observation from an MSF participant:

For example, we are conducting a series of pilot projects in the use of AI for KM, which is called "star mind". This was conceived through algorithms to receive employees' queries, and the system then searches for and makes available the most relevant and accurate "started answer" provided and rated by different experts. The system is designed to identify knowledge experts and solve problems. GIS, HIS, and decision-making diagnostic projects are also used in the field. Each of these AI-based systems have their own functions. For example, GIS is used for the rapid collection of data of maps of events from regions, considering climate, context, and population. It can be used to trace the evolution of an epidemic

outbreak. HIS and diagnostic decision-making systems help to decentralise healthcare into remote areas, where clinical specialists are not available. This allows for the use of trained community-based human resources, who can apply this technology for rapid diagnosis and decision making.

Searching for answers to RQ5 revealed a resistance to AI in some places, while elsewhere AI devices are used informally. Further research needs to be conducted to understand whether it is possible to generalise the use of AI in EROs.

Conclusions

The interview outcomes provided a significant understanding of the extent to which the frequency of mobility of highly skilled aid workers is providing fertile ground for further research due to its importance in an increasingly humanitarian knowledge-based economy. The qualitative comments identified a gap between the need for growth in humanitarian skilled workforce markets and the availability of a younger certified mobile workforce. The further research includes an extended investigation about a set of assumptions raised during qualitative research. The example of assumptions found is that “there is an increase in the use of contingent workforce in aid organization, which one of the assumptions was related to “low mobility of female workforce” to take long term assignments in the field. This assumption is also explored in the further research.

A comparison between existing standards and the interview comments provides insights into the study of a millennial workforce because the minimum educational requirement to take a management role in the aid sector is a masters degree. Managers older than 35 years have the advantage of experience-based value which is very important in aid organisations. Those employees are perceived as the gatekeepers of organisational knowledge, sustainability, and leadership.

This research is intended to help knowledge managers to scale up the existing store of tacit and implicit knowledge in their operations and to combine that with new technologies to provide value to the organisation. There is a need to create KM strategies to exploit tacit and implicit knowledge and integrate it into AI. This requires the use of a holistic knowledge transfer framework (see Figure 1 as an example) to facilitate the process of transformation of tacit and implicit knowledge into effective deliverables.

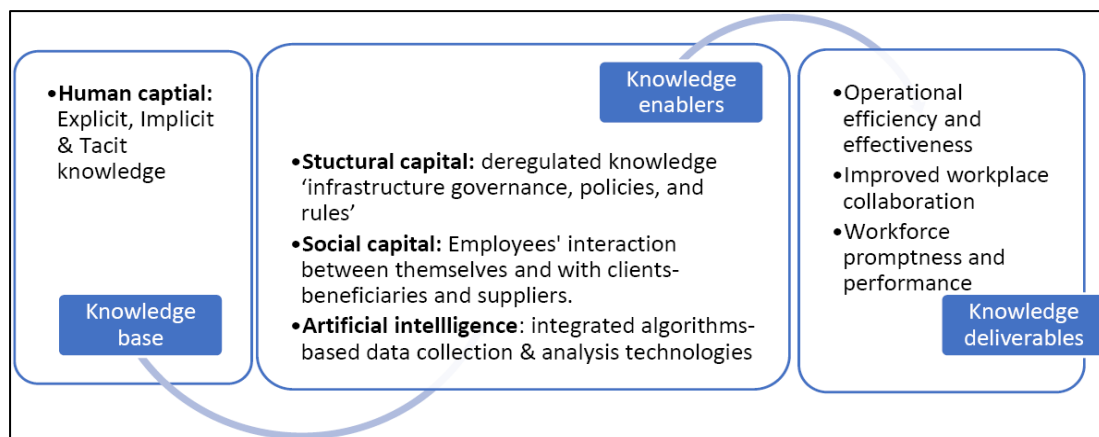


Figure 1. Holistic knowledge transfer framework.

This knowledge axis provides opportunities to encourage future developments of integrated KM concepts, to help KM practitioners effectively deliver knowledge to bottom-line activities. The relevance of human capital clearly lies in understanding how knowledge advantages may be generated by age differences, contingent

workforce management, collaboration, and the application of AI to improve efficiency in the aid sector.

It is now known that many organisations exclude an important part of their national workforce from their knowledge processes. They ignore the fact that differences in contractual status have a significant impact on the management of organisational knowledge and learning. Further, organisations need to develop procedures to discourage employees from using alternative, external applications to fill the gap generated by restrictions on their access to internal social networks. The current use of personal social networks as an alternative emphasises that their input to problem-solving is essential.

Lastly, this research found that most EROs currently use AI in their missions for concrete actions such as warehousing, inventory management, population counting, epidemiological data prediction, and modelling. As at 2019, all the five major organisations observed have more than one AI-based technology operating in their mission, whether in the form of a pilot project or as part of their routine operations. Some participants reported that they did not use AI, although upon discussions with teams from different departments within the same organisation, it was revealed that the technologies for GIS and other drone-based technologies were based on AI. The research findings demonstrated the need to train older workers in understanding the logic behind AI as well as interpreting and using the technology. Overall, aid workers agreed on the need for extensive use of technologies to help in performing data capture and analysis to inform decision-making throughout the aid sector.

Limitations

The researcher is aware of several limitations of this research. The first limitation is that the research does not focus on technology development, content management, and social media. This is because these topics are largely covered in the literature. This research focuses on the human perspective of KM, and it discusses how individual knowledge can be transferred between people and the ways that tacit and implicit knowledge can be articulated. Another limitation is that the study did not investigate the role of a female workforce more deeply, and how it could contribute to improving the knowledge gap in the field. This research did not answer all the questions raised by the organisations, regarding the challenges, gains and risks related to the use of AI in EROs. The unanswered points involve further research about the use of biometrics, facial recognition, and other public health image recognition services for this sector.

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